

Primary Diffuse Leptomeningeal Oligodendroglioma

Shawn L. Hervey-Jumper^a Michael Jumper^a Mila Blaivas^b Hermant A. Parmar^c
Patricia L. Robertson^d Cormac O. Maher^a

Departments of ^aNeurosurgery, ^bPathology, ^cRadiology and ^dPediatrics, University of Michigan Health System, Ann Arbor, Mich., USA

Case Illustration

A 9-year-old right-handed girl initially presented with a 2-day history of confusion, malaise, photophobia, cough, headaches and vomiting. On examination, she was found to have papilledema and minimal left-sided weakness. Frequent subclinical seizures arising from the right temporal region were identified on EEG monitoring, and brain and total spine MRI showed mild ventriculomegaly, diffuse leptomeningeal thickening and enhancement throughout the brain (slightly more prominent in the right temporal region), spinal cord and nerve roots, with respect to leptomeningeal spread of neoplasm or infection. Lumbar cerebrospinal fluid analysis re-

vealed elevated protein level of 72 mg/dl and 3 white blood cells with no neoplastic cells, therefore providing no evidence of malignancy or CNS infection. Antiepileptic medications were started, and the patient underwent a right temporal brain and leptomeningeal biopsy. Pathology revealed idiopathic leptomeningeal inflammation and fibrosis without brain involvement.

The patient improved clinically, but she returned multiple times over a 3-month period with intermittent ataxia, confusion, headaches and emesis. A ventriculoperitoneal shunt was placed for progressive ventriculomegaly. Serial imaging showed improvement in the hydrocephalus after cerebrospinal fluid diversion, but progressive leptomeningeal enhancement of the brain and spinal

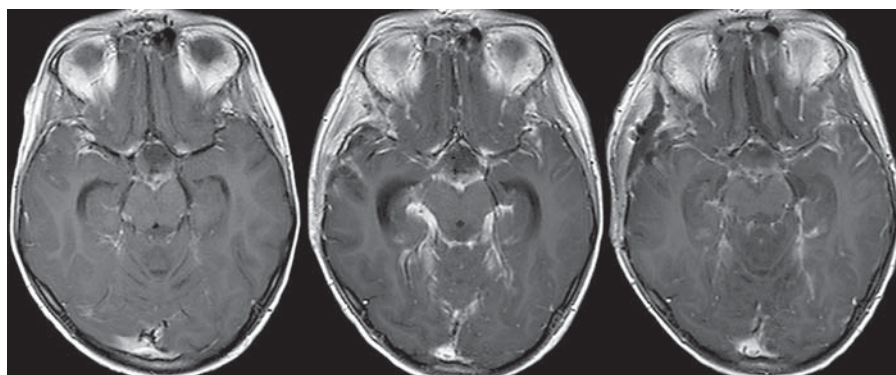


Fig. 1. Axial T₁-weighted brain MRI after gadolinium enhancement. Progressive leptomeningeal thickening and enhancement over a 6-month interval (left to right) before initiation of chemotherapy.

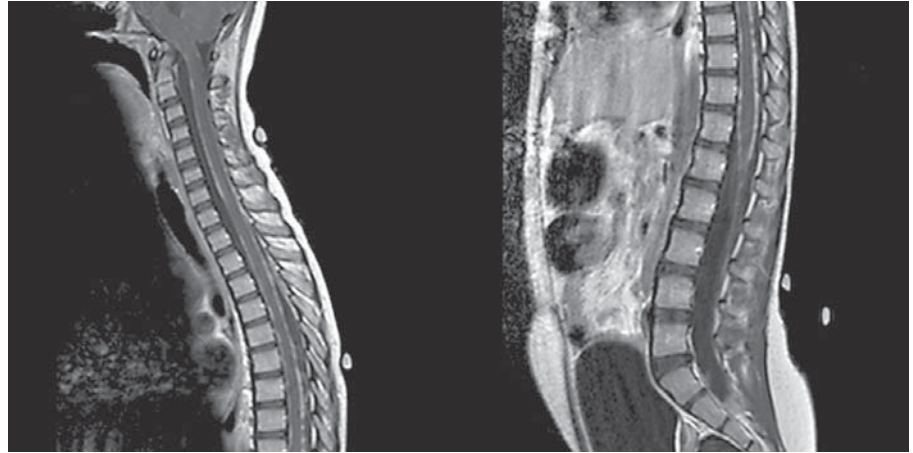


Fig. 2. MRI of the spine. Diffuse dural enhancement throughout all segments.

cord (fig. 1, 2). The patient continued to have functional neurological decline including intermittent lethargy, slurred speech and ataxia, resulting in the decision to perform a second brain and leptomeningeal biopsy of the right temporal lobe. Histopathology supported the diagnosis of leptomeningeal oligodendroglioma, grade 2 by WHO classification, associated with fibrosis and chronic inflammation (fig. 3). All neoplastic cells were positive for synaptophysin. There was chromosome 1p deletion with 19q preserved, and the MIB-1 proliferation index was 15–20%. There was no evidence of tumor within the biopsied temporal lobe parenchyma and no parenchymal tumor evident on MRI. Postoperatively, the patient received weekly treatments of intravenous carboplatin administered in 6-week cycles.

Discussion

Primary diffuse leptomeningeal oligodendrogliomas are rare tumors that present with diffuse leptomeningeal involvement in the absence of intraparenchymal oligodendroglioma. Leptomeningeal oligodendrogliomas are thought to arise from heterotopic nests of glial tissue within the subarachnoid space [1]. They are extremely rare; only 13 cases (including this report) have been reported, and were summarized by Michotte et al. [2]. Several cases of patients with diffuse leptomeningeal disease and a small, discrete, parenchymal nodule have been reported [3–6]. It is not clear if these cases represent a variant of primary diffuse leptomeningeal oligodendroglioma or a metastatic disease process from the parenchymal nodule. Children account for 6 of the 9 reported cases,

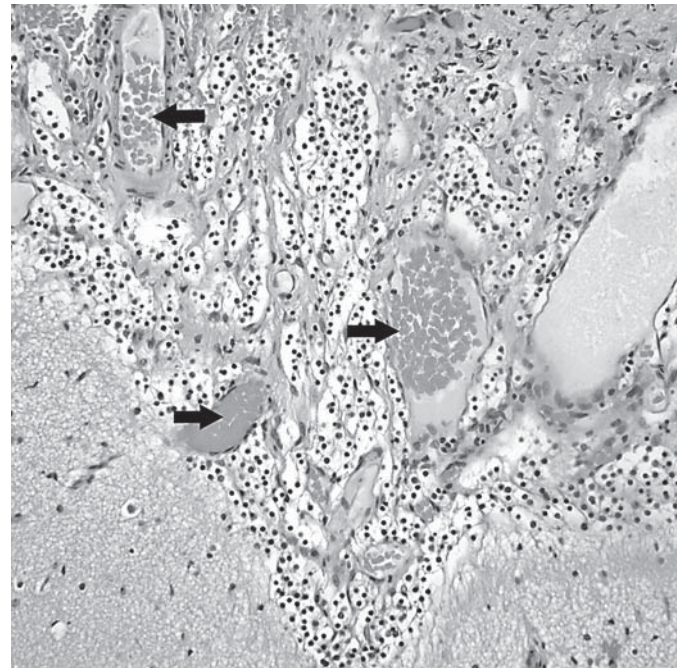


Fig. 3. Histopathological image. Dense arachnoid infiltration with tumor cells demonstrating uniform, sharply defined cellular borders and cellular nuclei with prominent perinuclear clearing. Note the prominent vessels (arrows) and absence of brain parenchyma involvement. HE.

and 4 of those 6 cases are associated with a small discrete nodule. The disease is almost universally fatal. Presenting symptoms include seizures, raised intracranial pressure and focal neurologic deficits.

Due to the rarity of these lesions, optimal treatment remains a matter of debate. Little is known about the ef-

fect of the chromosome 1p19q deletion status on tumor response to treatment and patient prognosis, especially since 1p19q codeletion is rare in children. Longer survival has been reported following chemotherapy and craniospinal radiation. Bourne et al. [7] reported stable disease after chemotherapy with cisplatin, vincristine, cyclophosphamide and etoposide, while Franceschi et al.

[8] recently described treatment of this condition with temozolomide. Palliation with good quality of life for 6–7 years was reported in response to treatment with carboplatin or carboplatin with vincristine in 2 pediatric patients with diffuse leptomeningeal oligodendroglioma associated with small spinal nodules [5, 6].

References

- 1 Cooper IS, Kernohan JW: Heterotopic glial nests in the subarachnoid space: histopathologic characteristics, mode of origin and relation to meningeal gliomas. *J Neuropathol Exp Neurol* 1951;10:16–29.
- 2 Michotte A, Chaskis C, Sadones J, Veld PI, Neyns B: Primary leptomeningeal anaplastic oligodendroglioma with a 1p36–19q13 deletion: report of a unique case successfully treated with temozolomide. *J Neurol Sci* 2009;287:267–270.
- 3 Armao DM, Stone J, Castillo M, Mitchell KM, Bouldin TW, Suzuki K: Diffuse leptomeningeal oligodendrogliomatosis: radiologic/pathologic correlation. *AJNR Am J Neuroradiol* 2000;21:1122–1126.
- 4 Daum S, Foncin JF, Nicolaïdis S, Oeconomos D: Diffuse gliomatosis of the leptomeninges and tuber oligodendrioma (in French). *Rev Neurol (Paris)* 1974;130:314–320.
- 5 Gilmer-Hill HS, Ellis WG, Imbesi SG, Boggan JE: Spinal oligodendroglioma with gliomatosis in a child: case report. *J Neurosurg* 2000;92:109–113.
- 6 Rossi S, Rodriguez FJ, Mota RA, dei Tos AP, di Paola F, Bendini M, Agostini S, Longatti P, Jenkins RB, Giannini C: Primary leptomeningeal oligodendroglioma with documented progression to anaplasia and t(1;19)(q10;p10) in a child. *Acta Neuropathol* 2009;118:575–577.
- 7 Bourne TD, Mandell JW, Matsumoto JA, Jane JA Jr, Lopes MB: Primary disseminated leptomeningeal oligodendroglioma with 1p deletion: case report. *J Neurosurg* 2006;105:465–469.
- 8 Franceschi E, Cavallo G, Scopece L, Esposti RD, Paioli G, Paioli A, Palmerini E, Foschini MP, Marliani AF, Crino L: Temozolomide-induced partial response in a patient with primary diffuse leptomeningeal gliomatosis. *J Neurooncol* 2005;73:261–264.